WHAT IS CLAIMED IS:

1. A full color LED (light-emitting diode) based lighting apparatus operated in synchronism with music comprising an audio frequency band-pass filter, a level comparator, an integration circuit, a microcontroller, and an LED drive circuit wherein:

the audio frequency band-pass filter is adapted to filter out signals other than a sound source in sound input for obtaining sound signals and amplify the sound signals prior to inputting to the level comparator;

the level comparator is adapted to further amplify the sound signals and convert amplified signals having a voltage higher than a reference voltage into square-wave signals prior to inputting to the integration circuit for frequency calculation;

the microcontroller comprises a CPU (central processing unit), a RAM (random access memory), and a ROM (read only memory) having a firmware for controlling the CPU; and

the integration circuit is adapted to process the square-wave signals fed from the level comparator for obtaining a corresponding frequency which is stored in a register so that the CPU is adapted to read out the frequency from the register, process input/output (I/O) and scan signals sent from the CPU, and send the processed signals to the LED drive circuit for controlling LED color,

whereby the full color LED based lighting apparatus operated in synchronism with music is adapted to be controlled by a single loop frequency.

2. A full color LED based lighting apparatus operated in synchronism with music comprising an audio frequency band-pass filter, a high frequency band-pass amplification circuit, a low frequency band-pass amplification circuit,

an integration circuit, a microcontroller, and an LED drive circuit wherein:

the audio frequency band-pass filter is adapted to filter out signals other than a sound source in sound input for obtaining sound signals and amplify the sound signals prior to inputting to the high frequency band-pass amplification circuit and the low frequency band-pass amplification circuit respectively;

the high frequency band-pass amplification circuit comprises a first level comparator together with the high frequency band-pass amplification circuit for forming a first detection loop of high frequency band being adapted to further amplify signals having a high frequency band and convert the amplified signals having a voltage higher than a reference voltage into square-wave signals prior to inputting to the integration circuit for frequency calculation;

the low frequency band-pass amplification circuit comprises a second level comparator together with the low frequency band-pass amplification circuit for forming a second detection loop of low frequency band being adapted to further amplify signals having a low frequency band and convert the amplified signals having a voltage higher than the reference voltage into square-wave signals prior to inputting to the integration circuit for frequency calculation;

the microcontroller comprises a CPU, a RAM, and a ROM having a firmware for controlling the CPU; and

the integration circuit is adapted to process the square-wave signals fed from the first level comparator for obtaining a corresponding frequency which is stored in a register so that the CPU is adapted to read out the frequency from the register, process I/O and scan signals sent from the CPU, and send the processed signals to the LED drive circuit for controlling background color of LEDs; the integration circuit is adapted to process the square-wave signals fed from the second level comparator for obtaining a corresponding frequency in response to input from the second detection loop, the corresponding frequency

being stored in the register so that the CPU is adapted to read out the frequency from the register; and the integration circuit is adapted to process I/O and scan signals sent from the CPU, and send the processed signals to the LED drive circuit for controlling foreground color of LEDs,

whereby dividing an audio frequency into a high frequency band and a low frequency band, causing one frequency band to control background color of LEDs, and causing the other one to control foreground color of LEDs will cause the full color LED based lighting apparatus operated in synchronism with music to be controlled by a double loop frequency.

3. The apparatus of claim 2, wherein the first detection loop of high frequency band is adapted to control foreground color of LEDs by means of the frequency and the second detection loop of high frequency band is adapted to control background color of LEDs by means of the frequency.

4. A full color LED based lighting apparatus operated in synchronism with music comprising an audio frequency band-pass filter, a high frequency band-pass amplification circuit, a low frequency band-pass amplification circuit, an intermediate frequency band-pass amplification circuit an integration circuit, a microcontroller, and an LED drive circuit wherein:

the audio frequency band-pass filter is adapted to filter out signals other than a sound source in sound input for obtaining sound signals and amplify the sound signals prior to inputting to the high frequency band-pass amplification circuit, the imtermediate frequency band-pass amplification circuit, and the low frequency band-pass amplification circuit respectively;

the high frequency band-pass amplification circuit comprises a first level comparator together with the high frequency band-pass amplification circuit for

forming a first detection loop of high frequency band being adapted to further amplify signals having a high frequency band and convert the amplified signals having a voltage higher than a reference voltage into square-wave signals prior to inputting to the integration circuit for frequency calculation;

the low frequency band-pass amplification circuit comprises a second level comparator together with the low frequency band-pass amplification circuit for forming a second detection loop of low frequency band being adapted to further amplify signals having a low frequency band and convert the amplified signals having a voltage higher than the reference voltage into square-wave signals prior to inputting to the integration circuit for frequency calculation;

the intermediate frequency band-pass amplification circuit comprises a third level comparator together with the intermediate frequency band-pass amplification circuit for forming a third detection loop of intermediate frequency band being adapted to further amplify signals having an intermediate frequency band and convert the amplified signals having a voltage higher than the reference voltage into square-wave signals prior to inputting to the integration circuit for frequency calculation;

the microcontroller comprises a CPU, a RAM, and a ROM having a firmware for controlling the CPU; and

the integration circuit is adapted to process the square-wave signals fed from the first level comparator for obtaining a corresponding frequency which is stored in a register so that the CPU is adapted to read out the frequency from the register, process I/O and scan signals sent from the CPU, and send the processed signals to the LED drive circuit for controlling blue LEDs; the integration circuit is adapted to process the square-wave signals fed from the second level comparator for obtaining a corresponding frequency in response to input from the second detection loop, the corresponding frequency being stored

in the register so that the CPU is adapted to read out the frequency from the register, process I/O and scan signals sent from the CPU, and send the processed signals to the LED drive circuit for controlling red LEDs; and the integration circuit is adapted to process the square-wave signals fed from the third level comparator for obtaining a corresponding frequency in response to input from the third detection loop, the corresponding frequency being stored in the register so that the CPU is adapted to read out the frequency from the register, process I/O and scan signals sent from the CPU, and send the processed signals to the LED drive circuit for controlling green LEDs,

whereby dividing an audio frequency into a high frequency band, an intermediate frequency band, and a low frequency band, causing the high frequency band to control blue LEDs, causing the intermediate frequency band to control green LEDs, and causing the low frequency band to control red LEDs will cause the full color LED based lighting apparatus operated in synchronism with music to be controlled by a triple loop frequency.

5. The apparatus of claim 4, wherein one of the followings is performed: the integration circuit is adapted to process the square-wave signals fed from the first level comparator for controlling blue LEDs, the integration circuit is adapted to process the square-wave signals fed from the second level comparator for controlling green LEDs, and the integration circuit is adapted to process the square-wave signals fed from the third level comparator for controlling red LEDs; the integration circuit is adapted to process the square-wave signals fed from the first level comparator for controlling red LEDs, the integration circuit is adapted to process the square-wave signals fed from the second level comparator for controlling blue LEDs, and the integration circuit is adapted to process the square-wave signals fed from the third level comparator for

controlling green LEDs; the integration circuit is adapted to process the square-wave signals fed from the first level comparator for controlling red LEDs, the integration circuit is adapted to process the square-wave signals fed from the second level comparator for controlling green LEDs, and the integration circuit is adapted to process the square-wave signals fed from the third level comparator for controlling blue LEDs; the integration circuit is adapted to process the square-wave signals fed from the first level comparator for controlling green LEDs, the integration circuit is adapted to process the square-wave signals fed from the second level comparator for controlling blue LEDs, and the integration circuit is adapted to process the square-wave signals fed from the third level comparator for controlling red LEDs; and the integration circuit is adapted to process the square-wave signals fed from the first level comparator for controlling green LEDs, the integration circuit is adapted to process the square-wave signals fed from the second level comparator for controlling red LEDs, and the integration circuit is adapted to process the square-wave signals fed from the third level comparator for controlling blue LEDs.

6. A full color LED based lighting apparatus operated in synchronism with music comprising an audio frequency band-pass filter, a first amplitude detection circuit, a band-pass amplification circuit, an integration circuit, a microcontroller, and an LED drive circuit wherein:

the audio frequency band-pass filter is adapted to filter out signals other than a sound source in sound input for obtaining sound signals and amplify the sound signals prior to inputting to the first amplitude detection circuit and the band-pass amplification circuit respectively;

the first amplitude detection circuit comprises an ADC (analog-to-digital

converter) together with the first amplitude detection circuit for forming an amplitude detection loop being adapted to obtain peaks of signals and convert the peaks of signals into digital amplitudes of signals by means of the ADC prior to inputting to the integration circuit for reading;

the band-pass amplification circuit comprises a fourth level comparator together with the band-pass amplification circuit for forming a frequency detection loop being is adapted to further amplify signals and convert the amplified signals having a voltage higher than a reference voltage into square-wave signals prior to inputting to the integration circuit for frequency calculation;

the microcontroller comprises a CPU, a RAM, and a ROM having a firmware for controlling the CPU; and

the integration circuit is adapted to store the amplitudes of signals in a register in response to input from the ADC so that the CPU is adapted to read out the amplitudes of signals fed from the register, process I/O and scan signals sent from the CPU, and send the processed signals to the LED drive circuit for controlling LED brightness; the integration circuit is adapted to store the square-wave signals in the register in response to input from the fourth level comparator so that the CPU is adapted to read out the square-wave signals from the register; and the integration circuit is adapted to process I/O and scan signals sent from the CPU, and send the processed signals to the LED drive circuit for controlling LED color,

whereby controlling LED color by changing a loop frequency and controlling LED brightness by changing a loop amplitude will cause the full color LED based lighting apparatus operated in synchronism with music to be controlled by a single loop frequency and a single loop amplitude.

7. A full color LED based lighting apparatus operated in synchronism with music comprising an audio frequency band-pass filter, a high frequency band-pass amplification circuit, a low frequency band-pass amplification circuit, a first amplitude detection circuit, an integration circuit, a microcontroller, and an LED drive circuit wherein:

the audio frequency band-pass filter is adapted to filter out signals other than a sound source in sound input for obtaining sound signals and amplify the sound signals prior to inputting to the high frequency band-pass amplification circuit, the low frequency band-pass amplification circuit, and the first amplitude detection circuit respectively;

the high frequency band-pass amplification circuit comprises a first level comparator together with the high frequency band-pass amplification circuit for forming a first detection loop of high frequency band being adapted to further amplify signals having a high frequency band and convert the amplified signals having a voltage higher than a reference voltage into square-wave signals prior to inputting to the integration circuit for frequency calculation;

the low frequency band-pass amplification circuit comprises a second level comparator together with the low frequency band-pass amplification circuit for forming a second detection loop of low frequency band being adapted to further amplify signals having a low frequency band and convert the amplified signals having a voltage higher than the reference voltage into square-wave signals prior to inputting to the integration circuit for frequency calculation;

the first amplitude detection circuit comprises an ADC together with the first amplitude detection circuit for forming an amplitude detection loop being adapted to obtain peaks of signals and convert the peaks of signals into digital amplitudes of signals by means of the ADC prior to inputting to the integration circuit for reading;

the microcontroller comprises a CPU, a RAM, and a ROM having a firmware for controlling the CPU; and

the integration circuit is adapted to process the square-wave signals fed from the first level comparator for obtaining a corresponding frequency which is stored in a register so that the CPU is adapted to read out the frequency from the register, process I/O and scan signals sent from the CPU, and send the processed signals to the LED drive circuit for controlling background color of LEDs; the integration circuit is adapted to process the square-wave signals fed from the second level comparator for obtaining a corresponding frequency which is stored in the register so that the CPU is adapted to read out the frequency from the register, process I/O and scan signals sent from the CPU, and send the processed signals to the LED drive circuit for controlling foreground color of LEDs; and the integration circuit is adapted to store the amplitudes of signals in the register in response to input from the ADC so that the CPU is adapted to read out the amplitudes of signals fed from the register, process I/O and scan signals sent from the CPU, and send the processed signals to the LED drive circuit for controlling a whole LED brightness,

whereby dividing an audio frequency into a high frequency band and a low frequency band, causing one frequency band to control background color of LEDs, causing the other one to control foreground color of LEDs, and controlling the whole LED brightness by a loop amplitude will cause the full color LED based lighting apparatus operated in synchronism with music to be controlled by a double loop frequency and a single loop amplitude.

8. The apparatus of claim 7, wherein the first detection loop of high frequency band is adapted to control foreground color of LEDs by means of the frequency and the second detection loop of high frequency band is adapted to control

background color of LEDs by means of the frequency.

9. A full color LED based lighting apparatus operated in synchronism with music comprising an audio frequency band-pass filter, a high frequency band-pass amplification circuit, a low frequency band-pass amplification circuit, a second amplitude detection circuit, a third amplitude detection circuit, an integration circuit, a microcontroller, and an LED drive circuit wherein:

the audio frequency band-pass filter is adapted to filter out signals other than a sound source in sound input for obtaining sound signals and amplify the sound signals prior to inputting to the high frequency band-pass amplification circuit and the low frequency band-pass amplification circuit respectively;

the high frequency band-pass amplification circuit comprises a first level comparator together with the high frequency band-pass amplification circuit for forming a first detection loop of high frequency band being adapted to further amplify signals having a high frequency band and convert the amplified signals having a voltage higher than a reference voltage into square-wave signals prior to inputting to the integration circuit for frequency calculation;

the low frequency band-pass amplification circuit comprises a second level comparator together with the low frequency band-pass amplification circuit for forming a second detection loop of low frequency band being adapted to further amplify signals having a low frequency band and convert the amplified signals having a voltage higher than the reference voltage into square-wave signals prior to inputting to the integration circuit for frequency calculation;

the first amplitude detection circuit comprises a first ADC together with the first amplitude detection circuit for forming a detection loop of high frequency amplitude being adapted to obtain peaks of signals having a high frequency and convert the peaks of signals into digital amplitudes of signals by means of the

first ADC prior to inputting to the integration circuit for reading;

the second amplitude detection circuit comprises a second ADC together with the second amplitude detection circuit for forming a detection loop of low frequency amplitude being adapted to obtain peaks of signals having a low frequency and convert the peaks of signals into digital amplitudes of signals by means of the second ADC prior to inputting to the integration circuit for reading;

the microcontroller comprises a CPU, a RAM, and a ROM having a firmware for controlling the CPU; and

the integration circuit is adapted to process the square-wave signals fed from the first level comparator for obtaining a corresponding frequency which is stored in a register so that the CPU is adapted to read out the frequency from the register, process I/O and scan signals sent from the CPU, and send the processed signals to the LED drive circuit for controlling background color of LEDs; the integration circuit is adapted to process the square-wave signals fed from the second level comparator for obtaining a corresponding frequency which is stored in the register so that the CPU is adapted to read out the frequency from the register, process I/O and scan signals sent from the CPU, and send the processed signals to the LED drive circuit for controlling foreground color of LEDs; the integration circuit is adapted to store the amplitudes of signals in the register in response to input from the first ADC so that the CPU is adapted to read out the amplitudes of signals fed from the register, process I/O and scan signals sent from the CPU, and send the processed signals to the LED drive circuit for controlling brightness of the first detection loop; and the integration circuit is adapted to store the amplitudes of signals in the register in response to input from the second ADC so that the CPU is adapted to read out the amplitudes of signals fed from the register, process I/O and scan signals sent from the CPU, and send the processed

signals to the LED drive circuit for controlling brightness of the second detection loop,

whereby dividing an audio frequency into a high frequency band and a low frequency band, causing one frequency band to control background color of LEDs, causing the other one to control foreground color of LEDs, and controlling a loop brightness by a loop amplitude will cause the full color LED based lighting apparatus operated in synchronism with music to be controlled by a double loop frequency and a double loop amplitude.

10. A full color LED based lighting apparatus operated in synchronism with music comprising an audio frequency band-pass filter, a high frequency band-pass amplification circuit, a low frequency band-pass amplification circuit, an intermediate frequency band-pass amplification circuit, a first amplitude detection circuit, an integration circuit, a microcontroller, and an LED drive circuit wherein:

the audio frequency band-pass filter is adapted to filter out signals other than a sound source in sound input for obtaining sound signals and amplify the sound signals prior to inputting to the high frequency band-pass amplification circuit, the low frequency band-pass amplification circuit, and the intermediate frequency band-pass amplification circuit respectively;

the high frequency band-pass amplification circuit comprises a first level comparator together with the high frequency band-pass amplification circuit for forming a first detection loop of high frequency band being adapted to further amplify signals having a high frequency band and convert the amplified signals having a voltage higher than a reference voltage into square-wave signals prior to inputting to the integration circuit for frequency calculation;

the low frequency band-pass amplification circuit comprises a second level

comparator together with the low frequency band-pass amplification circuit for forming a second detection loop of low frequency band being adapted to further amplify signals having a low frequency band and convert the amplified signals having a voltage higher than the reference voltage into square-wave signals prior to inputting to the integration circuit for frequency calculation;

the intermediate frequency band-pass amplification circuit comprises a third level comparator together with the intermediate frequency band-pass amplification circuit for forming a third detection loop of intermediate frequency band being adapted to further amplify signals having an intermediate frequency band and convert the amplified signals having a voltage higher than the reference voltage into square-wave signals prior to inputting to the integration circuit for frequency calculation;

the first amplitude detection circuit comprises an ADC together with the first amplitude detection circuit for forming an amplitude detection loop being adapted to obtain peaks of signals and convert the peaks of signals into digital amplitudes of signals by means of the ADC prior to inputting to the integration circuit for reading;

the microcontroller comprises a CPU, a RAM, and a ROM having a firmware for controlling the CPU; and

the integration circuit is adapted to process the square-wave signals fed from the first level comparator for obtaining a corresponding frequency which is stored in a register so that the CPU is adapted to read out the frequency from the register, process I/O and scan signals sent from the CPU, and send the processed signals to the LED drive circuit for controlling blue LEDs; the integration circuit is adapted to process the square-wave signals fed from the second level comparator for obtaining a corresponding frequency in response to input from the second detection loop, the corresponding frequency being stored

in the register so that the CPU is adapted to read out the frequency from the register, process I/O and scan signals sent from the CPU, and send the processed signals to the LED drive circuit for controlling red LEDs; the integration circuit is adapted to process the square-wave signals fed from the third level comparator for obtaining a corresponding frequency in response to input from the third detection loop, the corresponding frequency being stored in the register so that the CPU is adapted to read out the frequency from the register, process I/O and scan signals sent from the CPU, and send the processed signals to the LED drive circuit for controlling green LEDs; and the integration circuit is adapted to store the amplitudes of signals in the register in response to input from the ADC so that the CPU is adapted to read out the amplitudes of signals fed from the register, process I/O and scan signals sent from the CPU, and send the processed signals to the LED drive circuit for controlling a whole LED brightness,

whereby dividing an audio frequency into a high frequency band, an intermediate frequency band, and a low frequency band for controlling blue, red, and green color LEDs respectively, and controlling the whole LED brightness by a loop amplitude will cause the full color LED based lighting apparatus operated in synchronism with music to be controlled by a triple loop frequency and a single loop amplitude.

11. The apparatus of claim 10, wherein one of the followings is performed: the integration circuit is adapted to process the square-wave signals fed from the first level comparator for controlling blue LEDs, the integration circuit is adapted to process the square-wave signals fed from the second level comparator for controlling green LEDs, and the integration circuit is adapted to process the square-wave signals fed from the third level comparator for controlling red LEDs;

the integration circuit is adapted to process the square-wave signals fed from the first level comparator for controlling red LEDs, the integration circuit is adapted to process the square-wave signals fed from the second level comparator for controlling blue LEDs, and the integration circuit is adapted to process the square-wave signals fed from the third level comparator for controlling green LEDs; the integration circuit is adapted to process the square-wave signals fed from the first level comparator for controlling red LEDs, the integration circuit is adapted to process the square-wave signals fed from the second level comparator for controlling green LEDs, and the integration circuit is adapted to process the square-wave signals fed from the third level comparator for controlling blue LEDs; the integration circuit is adapted to process the square-wave signals fed from the first level comparator for controlling green LEDs, the integration circuit is adapted to process the square-wave signals fed from the second level comparator for controlling blue LEDs, and the integration circuit is adapted to process the square-wave signals fed from the third level comparator for controlling red LEDs; and the integration circuit is adapted to process the square-wave signals fed from the first level comparator for controlling green LEDs, the integration circuit is adapted to process the square-wave signals fed from the second level comparator for controlling red LEDs, and the integration circuit is adapted to process the square-wave signals fed from the third level comparator for controlling blue LEDs.

12. A full color LED based lighting apparatus operated in synchronism with music comprising an audio frequency band-pass filter, a high frequency band-pass amplification circuit, a low frequency band-pass amplification circuit, an intermediate frequency band-pass amplification circuit, a second amplitude

detection circuit, a third amplitude detection circuit, a fourth amplitude detection circuit, an integration circuit, a microcontroller, and an LED drive circuit wherein:

the audio frequency band-pass filter is adapted to filter out signals other than a sound source in sound input for obtaining sound signals and amplify the sound signals prior to inputting to the high frequency band-pass amplification circuit, the low frequency band-pass amplification circuit, and the intermediate frequency band-pass amplification circuit respectively;

the high frequency band-pass amplification circuit comprises a first level comparator together with the high frequency band-pass amplification circuit for forming a first detection loop of high frequency band being adapted to further amplify signals having a high frequency band and convert the amplified signals having a voltage higher than a reference voltage into square-wave signals prior to inputting to the integration circuit for frequency calculation;

the low frequency band-pass amplification circuit comprises a second level comparator together with the low frequency band-pass amplification circuit for forming a second detection loop of low frequency band being adapted to further amplify signals having a low frequency band and convert the amplified signals having a voltage higher than the reference voltage into square-wave signals prior to inputting to the integration circuit for frequency calculation;

the intermediate frequency band-pass amplification circuit comprises a third level comparator together with the intermediate frequency band-pass amplification circuit for forming a third detection loop of intermediate frequency band being adapted to further amplify signals having an intermediate frequency band and convert the amplified signals having a voltage higher than the reference voltage into square-wave signals prior to inputting to the integration circuit for frequency calculation;

the second amplitude detection circuit comprises a first ADC together with

the second amplitude detection circuit for forming a detection loop of high frequency amplitude being adapted to obtain peaks of signals having a high frequency and convert the peaks of signals into digital high frequency amplitudes of signals by means of the first ADC prior to inputting to the integration circuit for reading;

the third amplitude detection circuit comprises a second ADC together with the third amplitude detection circuit for forming a detection loop of low frequency amplitude being adapted to obtain peaks of signals having a low frequency and convert the peaks of signals into digital low frequency amplitudes of signals by means of the second ADC prior to inputting to the integration circuit for reading;

the fourth amplitude detection circuit comprises a third ADC together with the third amplitude detection circuit for forming a detection loop of intermediate frequency amplitude being adapted to obtain peaks of signals having an intermediate frequency and convert the peaks of signals into digital intermediate frequency amplitudes of signals by means of the third ADC prior to inputting to the integration circuit for reading;

the microcontroller comprises a CPU, a RAM, and a ROM having a firmware for controlling the CPU; and

the integration circuit is adapted to process the square-wave signals fed from the first level comparator for obtaining a corresponding frequency which is stored in a register so that the CPU is adapted to read out the frequency from the register, process I/O and scan signals sent from the CPU, and send the processed signals to the LED drive circuit for controlling blue LEDs; the integration circuit is adapted to process the square-wave signals fed from the second level comparator for obtaining a corresponding frequency in response to input from the second detection loop, the corresponding frequency being stored in the register so that the CPU is adapted to read out the frequency from the

register, process I/O and scan signals sent from the CPU, and send the processed signals to the LED drive circuit for controlling red LEDs; the integration circuit is adapted to process the square-wave signals fed from the third level comparator for obtaining a corresponding frequency in response to input from the third detection loop, the corresponding frequency being stored in the register so that the CPU is adapted to read out the frequency from the register, process I/O and scan signals sent from the CPU, and send the processed signals to the LED drive circuit for controlling green LEDs; the integration circuit is adapted to store the amplitudes of signals in the register in response to input from the first ADC so that the CPU is adapted to read out the amplitudes of signals fed from the register, process I/O and scan signals sent from the CPU, and send the processed signals to the LED drive circuit for controlling brightness of the first detection loop; the integration circuit is adapted to store the amplitudes of signals in the register in response to input from the second ADC so that the CPU is adapted to read out the amplitudes of signals fed from the register, process I/O and scan signals sent from the CPU, and send the processed signals to the LED drive circuit for controlling brightness of the second detection loop; and the integration circuit is adapted to store the amplitudes of signals in the register in response to input from the third ADC so that the CPU is adapted to read out the amplitudes of signals fed from the register, process I/O and scan signals sent from the CPU, and send the processed signals to the LED drive circuit for controlling brightness of the third detection loop,

whereby dividing an audio frequency into a high frequency band, an intermediate frequency band, and a low frequency band for controlling blue, red, and green color LEDs respectively, and controlling a loop brightness by a loop amplitude will cause the full color LED based lighting apparatus operated in

synchronism with music to be controlled by a triple loop frequency and triple loop amplitude.

13. The apparatus of claim 12, wherein one of the followings is performed: the integration circuit is adapted to process the square-wave signals fed from the first level comparator for controlling blue LEDs, the integration circuit is adapted to process the square-wave signals fed from the second level comparator for controlling green LEDs, and the integration circuit is adapted to process the square-wave signals fed from the third level comparator for controlling red LEDs; the integration circuit is adapted to process the square-wave signals fed from the first level comparator for controlling red LEDs, the integration circuit is adapted to process the square-wave signals fed from the second level comparator for controlling blue LEDs, and the integration circuit is adapted to process the square-wave signals fed from the third level comparator for controlling green LEDs; the integration circuit is adapted to process the square-wave signals fed from the first level comparator for controlling red LEDs, the integration circuit is adapted to process the square-wave signals fed from the second level comparator for controlling green LEDs, and the integration circuit is adapted to process the square-wave signals fed from the third level comparator for controlling blue LEDs; the integration circuit is adapted to process the square-wave signals fed from the first level comparator for controlling green LEDs, the integration circuit is adapted to process the square-wave signals fed from the second level comparator for controlling blue LEDs, and the integration circuit is adapted to process the square-wave signals fed from the third level comparator for controlling red LEDs; and the integration circuit is adapted to process the square-wave signals fed from the first level comparator for controlling green LEDs, the integration circuit is adapted to

process the square-wave signals fed from the second level comparator for controlling red LEDs, and the integration circuit is adapted to process the square-wave signals fed from the third level comparator for controlling blue LEDs.

14. In a full color LED based lighting apparatus operated in synchronism with music including an audio frequency band-pass filter, a level comparator, an integration circuit, a microcontroller, and an LED drive circuit, a method of controlling the full color LED based lighting control apparatus with respect to a single loop frequency, the method comprising the steps of:

(a) initializing a register and I/O (input/output) values, clearing an SRAM (static RAM), and set parameters;

(b) reading out display function parameters from an input port; and

(c) calling a subroutine.

15. The method of claim 14, wherein the subroutine comprises calling an interrupt subroutine for outputting signals to the integration circuit in response to data in a scan buffer of the SRAM.

16. In a full color LED based lighting apparatus operated in synchronism with music including an audio frequency band-pass filter, a level comparator, an integration circuit, a microcontroller, and an LED drive circuit, a method of controlling the full color LED based lighting control apparatus with respect to a single loop frequency, the method comprising the steps of:

initializing a register and I/O (input/output) values, clearing an SRAM (static RAM), and set parameters;

reading out display function parameters from an input port;

determining a machine type from a read machine type parameter; and

calling one of a plurality of subroutines based on the machine type.

17. The method of claim 16, wherein a first subroutine with respect to the single loop frequency comprises the steps of:

reading out a frequency from the integration circuit;

selecting a corresponding LED color based on the frequency; and

displaying based on display function parameters prior to returning.

18. The method of claim 16, wherein the full color LED based lighting apparatus operated in synchronism with music comprises an audio frequency band-pass filter, a high frequency band-pass amplification circuit, a first level comparator, a low frequency band-pass amplification circuit, a second level comparator, an integration circuit, a microcontroller, and an LED drive circuit, and a second subroutine with respect to a double loop frequency comprises the steps of:

reading out frequencies of a high frequency loop and a low frequency loop from the integration circuit;

selecting a corresponding background color of LEDs based on the frequency of the high frequency loop and selecting a corresponding foreground color of the LEDs based on the frequency of the low frequency loop; and

displaying based on the display function parameters prior to returning.

19. The method of claim 16, wherein the full color LED based lighting apparatus operated in synchronism with music comprises an audio frequency band-pass filter, a high frequency band-pass amplification circuit, a first level comparator, a low frequency band-pass amplification circuit, a second level

comparator, an intermediate frequency band-pass amplification circuit, a third level comparator, an integration circuit, a microcontroller, and an LED drive circuit, and a third subroutine with respect to a triple loop frequency comprises the steps of:

reading out frequencies of a high frequency loop, an intermediate frequency loop, and a low frequency loop from the integration circuit;

selecting a corresponding blue LED based on the frequency of the high frequency loop, selecting a corresponding red LED based on the frequency of the low frequency loop, and selecting a corresponding green LED based on the frequency of the intermediate frequency loop; and

displaying based on the display function parameters prior to returning.

20. The method of claim 16, wherein the full color LED based lighting apparatus operated in synchronism with music comprises an audio frequency band-pass filter, a first amplitude detection circuit, a first ADC, a band-pass amplification circuit, a fourth level comparator, an integration circuit, a microcontroller, and an LED drive circuit, and a fourth subroutine with respect to a single loop frequency and a single loop amplitude comprises the steps of:

reading out a frequency of a frequency loop and an amplitude of an amplitude loop from the integration circuit;

selecting a corresponding LED color based on the frequency and adjusting LED brightness based on the amplitude of the amplitude loop; and

displaying based on the display function parameters prior to returning.

21. The method of claim 16, wherein the full color LED based lighting apparatus operated in synchronism with music comprises an audio frequency band-pass filter, a high frequency band-pass amplification circuit, a first level

comparator, a low frequency band-pass amplification circuit, a second level comparator, a first amplitude detection circuit, an integration circuit, a microcontroller, and an LED drive circuit, and a fifth subroutine with respect to a double loop frequency and a single loop amplitude comprises the steps of:

reading out frequencies of a high frequency loop and a low frequency loop and an amplitude of an amplitude loop from the integration circuit;

selecting a corresponding background color of LEDs based on the frequency of the high frequency loop, selecting a corresponding foreground color of the LEDs based on the frequency of the low frequency loop, and adjusting LED brightness based on the amplitude of the amplitude loop; and

displaying based on the display function parameters prior to returning.

22. The method of claim 16, wherein the full color LED based lighting apparatus operated in synchronism with music comprises an audio frequency band-pass filter, a high frequency band-pass amplification circuit, a first level comparator, a low frequency band-pass amplification circuit, a second level comparator, a second amplitude detection circuit, a first ADC, a third amplitude detection circuit, a second ADC, an integration circuit, a microcontroller, and an LED drive circuit, and a sixth subroutine with respect to a double loop frequency and a double loop amplitude comprises the steps of:

reading out frequencies of a high frequency loop and a low frequency loop and amplitudes of a high frequency amplitude loop and a low frequency amplitude loop respectively;

selecting a corresponding background color of the LEDs based on the frequency of the high frequency loop, selecting a corresponding foreground color of the LEDs based on the frequency of the low frequency loop, adjusting a background brightness of the LEDs based on the frequency of the high

frequency amplitude, and adjusting a foreground brightness of the LEDs based on the frequency of the low frequency amplitude; and

displaying based on the display function parameters prior to returning.

23. The method of claim 16, wherein the full color LED based lighting apparatus operated in synchronism with music comprises an audio frequency band-pass filter, a high frequency band-pass amplification circuit, a first level comparator, a low frequency band-pass amplification circuit, a second level comparator, an intermediate frequency band-pass amplification circuit, a third level comparator, a first amplitude detection circuit, an ADC, an integration circuit, a microcontroller, and an LED drive circuit, and a seventh subroutine with respect to a triple loop frequency and a single loop amplitude comprises the steps of:

reading out frequencies of a high frequency loop, an intermediate frequency loop, and a low frequency loop, and an amplitude of an amplitude loop from the integration circuit;

selecting a corresponding red LED based on the frequency of the low frequency loop, selecting a corresponding green LED based on the frequency of the intermediate frequency loop, selecting a corresponding blue LED based on the frequency of the high frequency loop, and adjusting LED brightness based on the amplitude of the amplitude loop; and

displaying based on the display function parameters prior to returning.

24. The method of claim 16, wherein the full color LED based lighting apparatus operated in synchronism with music comprises an audio frequency band-pass filter, a high frequency band-pass amplification circuit, a first level comparator, a low frequency band-pass amplification circuit, a second level

comparator, an intermediate frequency band-pass amplification circuit, a third level comparator, a second amplitude detection circuit, a first ADC, a third amplitude detection circuit, a second ADC, a fourth amplitude detection circuit, a third ADC, an integration circuit, a microcontroller, and an LED drive circuit, and an eighth subroutine with respect to a triple loop frequency and triple loop amplitude comprises the steps of:

reading out frequencies of a high frequency loop, an intermediate frequency loop, and a low frequency loop, and amplitudes of a high frequency amplitude loop, an intermediate frequency amplitude loop, and a low frequency amplitude loop from the integration circuit;

selecting a corresponding red LED based on the frequency of the low frequency loop, selecting a corresponding green LED based on the frequency of the intermediate frequency loop, selecting a corresponding blue LED based on the frequency of the high frequency loop, adjusting brightness of the red LED based on the low frequency amplitude, adjusting brightness of the green LED based on the intermediate frequency amplitude, and adjusting brightness of the blue LED based on the high frequency amplitude; and

displaying based on the display function parameters prior to returning.

25. A full color LED based lighting control method, comprising:

selecting a color;

referring a lookup table to select the color; and

establishing a color conversion table.

26. The method of claim 25, wherein the color conversion table comprises a single color conversion table and a full color conversion table.

27. A full color LED based lighting control method, comprising the step of carrying out a full frequency range equal division wherein each frequency scale is 20Hz with 999 (19,980/20=999) scales, a first color table corresponds to 20Hz to 39Hz, a second color table corresponds to 40Hz to 59Hz, a third color table corresponds to 60Hz to 79Hz, ..., and a 999th color table corresponds to 19,980Hz to 19,999Hz.

28. The method of claim 27, further comprising the step of carrying out a full frequency range equal section division wherein the full frequency range is divided into a plurality of equal sections each being further divided into a plurality of equal scales with a total number of the scales being 303 (10+12+15+20+40+50+60+80+76=303).

29. The method of claim 28, further comprising the step of carrying out a full frequency range sine function calculation scale division wherein the bandwidth (bw) is 19,980Hz, and the number of the scales is s, the frequency is f so that if f0=f-19 then the corresponding color table (tb) is equal to s × sin ((f0/bw) × 90) or s × sin(f0/222), an integral part of tb is chosen based on unconditional carry rule, tb=300 sin(f0/222) if s is 300, and tb is at a range from 1 to 300 after choosing the integral part of tb.

30. A full color LED based lighting control method, comprising the step of adjusting brightness by means of amplitude by performing operations comprising:

causing an amplitude ratio to be 90/FF if color values of R, G, and B are FF, 3F, and 7F (hex) respectively after frequency conversion, and an amplitude is 90 (hex); and

obtaining converted color values of R, G, and B of

$$R = FF \times 90/FF = 90$$

$$G = 3F \times 90/FF = 23$$

$$B = 7F \times 90/FF = 47$$

after multiplying the amplitude ratio.